(19) Europäisch s Patentamt
European Patent Office
Office européen des brevets

(11) Publication numb r : **0 684 424 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **95303479.0**

(22) Date of filing : **24.05.95**

(51) Int. Cl.[6] : **F21V 11/08**, F21P 5/00, F21V 11/18

(30) Priority : **26.05.94 GB 9410542**

(43) Date of publication of application : **29.11.95 Bulletin 95/48**

(84) Designated Contracting States : **BE DE FR IT**

(71) Applicant : **STRAND LIGHTING LIMITED**
Grant Way (Off Syon Lane)
Isleworth Middlesex TW7 5QD (GB)

(72) Inventor : **Freeborn, Martin**
59 Dean Ridge,
Gowkhall
Dunfermline, Fife, KY12 9PE (GB)
Inventor : **Whitton, Thomas Johnston**
"Tamora",
West End
Star, Glenrothes, Fife, KY7 6JZ (GB)

(74) Representative : **Beresford, Keith Denis Lewis et al**
BERESFORD & Co.
2-5 Warwick Court
High Holborn
London WC1R 5DJ (GB)

(54) Luminaire.

(57) The present invention concerns a luminaire shutter housing having a plurality of shutter blades and comprising a pair of opposed surfaces each having axially aligned apertures through which light from a light source can pass along an optical axis, and means for retaining between the surfaces the shutter blades so that the shutter blades can be independently pivoted with respect to the optical axis over an arc of or exceeding 90°.

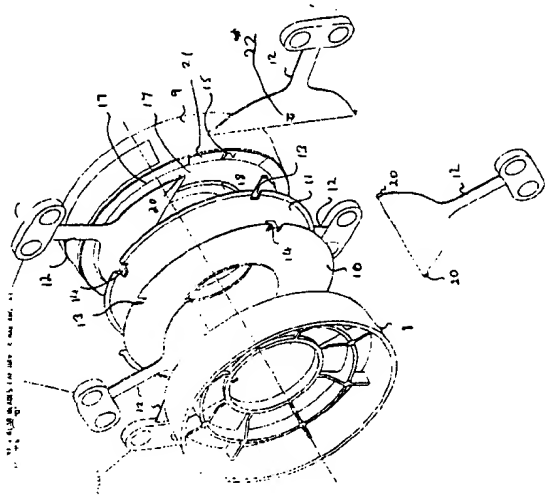

figure 2

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BACKGROUND OF THE INVENTION

The present invention relates to a gate and shutter assembly for use in a luminaire, in other words a lamp unit, particularly, but not exclusively, for application in the atre, studio or other entertainment lighting, to provide a shaped spot of light.

In, for example, theatre lighting it is often desired to produce a square or rectangular patch of light so as to give the impression of light through a window. For this purpose, an aperture (gate) and shutter assembly is provided within the luminaire housing. The gate comprises a plate mounted transverse to the beam from the luminaire having a central aperture. A plurality of shutters (usually at least four) is provided, each shutter comprising a blade within the plane of the gate and a handle projecting out from the luminaire housing through a slot. By manipulating the handle for each blade, the operator can swivel the blade angularly through a range defined by the angular extent of the slot in the housing. He can also push the shutter in and out to reduce the amount of light passing through the gate. Commonly, two shutter blades are provided on either side of the gate, through slots disposed on opposite sides of the luminaire housing. The pair of shutters on one side of the gate is oriented at 90° relative to the pair on the other side.

The extent of motion of each shutter blade is therefore dictated by the angular extent, round the luminaire housing, of the slot through which the handle of that shutter blade passes. Each slot must, of course, extend from the central cavity of the luminaire right through to the outside of the housing where it can be manipulated by a human operator. However, a luminaire is a heavy piece of equipment and one that is often moved from one place to another. It is therefore necessary for the luminaire housing to be relatively strongly built. The portion of the luminaire housing lying behind the gate and shutter assembly comprises the light source, associated electrical components and a light collection system directing light forwardly from the light source. The portion of the luminaire housing forward of the gate and shutter assembly contains imaging lenses, which produce a beam focused from the plane of the gate so that the plane formed by the shutters is the shape in cross-section of the image projected on the stage.

Thus there are heavy components at either side of the gate and shutter assembly and in prior luminaires linking the two is achieved solely by the material within the lands or space for bolts passing from front to rear between the slots. In order to provide sufficient structural strength to the luminaire housing, it has hitherto been necessary to provide relatively thick lands between the slots, and this has dictated the maximum angular extent of the slots.

One solution to this problem is disclosed in UK Patent Specification No. 9207048.1 in the name of the present applicants. However it will be appreciated that the material in which the slots are formed is still used to provide structural integrity for the luminaire as a whole.

It will also be appreciated that luminaires are frequently used with very powerful light sources and as a consequence exposed to considerable heating.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a luminaire which not only allows substantial angular movement of shutter blades but which is capable of withstanding high temperatures in operation and in which the structural integrity of the housing is not compromised by the provision of the slots in which the shutter blades can move.

In accordance with the invention there is provided a luminaire shutter housing having a plurality of shutter blades and comprising a pair of opposed surfaces each having axially aligned apertures through which light from a light source can pass along an optical axis, and means for retaining between the surfaces the shutter blades so that the shutter blades can each be independently pivoted with respect to the optical axis over an arc of or exceeding 90°.

In order that the present invention may be more readily understood, an embodiment thereof will now be described by way of example and with reference to the accompanying drawings, in which:-

Figure 1 is an exploded view of a luminaire according to the present invention taken transverse to the optical axis of the luminaire; and

Figure 2 is an exploded perspective view of components of the luminaire of Figure 1.

Referring now to the drawings, there is shown a luminaire housing generally indicated at 1 and comprising an outer casing formed from a pair of aluminium cast members 2 and 3. Each casing member is essentially in the form of a plate 4 having a central aperture 5 through which a light beam can pass from a suitable light source (not shown), and four short leg-like members located one at each corner of the plate 4. The legs 6 of the two casing members are provided with suitable mating projections and recesses so as to maintain the required alignment between the casing members. The legs 6 also have matching screw-threaded bores so that the casing members can be joined into a single structural unit by four screw-threaded bolts. Casing member 2 has a lip around its central aperture 5 which receives a circular metal spring washer 7. In the assembled luminaire housing the remaining components of the housing are clamped within the outer casing.

These comprise a pair of frusto-conical members 8 and 9, also of cast aluminium, a pair of centre rings 10 and 11 and six shutter blades 12. The centre rings 10 and 11 are not made from aluminium but are made

from a material such as st el which has greater resistance to thermal distortion than aluminium. The centre hole in ring 10 has a larger diameter than ring 11. The main body of each shutter blade is made from steel, and the grip at the top of each blade 12 is made from a suitable thermoplastics material having poor thermal conductivity.

Each of the centre rings 10 and 11 is provided on its perimeter with a pair of diametrically opposed rectangular recesses 13. In Figure 2 only one recess per ring is shown due to the perspective from which the figure is taken. Each centre ring is also provided with a pair of diametrically opposed projections 14 pressed from the perimeter of the ring. When the luminaire is assembled each projection 14 on one centre ring passes through a recess 13 on the other ring to mate with a socket 15 provided on one or the other of the ring members 8 and 9. Only one such socket can be seen in Figure 2 but it will be appreciated that each member 8 or 9 will have a pair of such sockets and that these sockets will also be diametrically opposed to one another. In this simple manner the two members 8 and 9 and the centre rings 10 and 11 can be held in a fixed relationship so that no one element can rotate with respect to the other elements. When the housing has been assembled the spring washer 7 provides the bias by means of which the shutter blades 12 are held against unwanted movement.

From Figures 1 and 2 it will be seen that the blades 12 are arranged in three pairs with the first pair being located between member 8 and central ring 10, the second pair located between the two centre rings 10 and 11 and the third pair located between centre ring 11 and member 9. In order to locate the blades of the first and third pairs, each of the members 8 and 9 is provided on its face with a recessed annular track 17 which is defined between an inner axially extending boss 18 and an outer annular rim 19. The outermost ends of each of the blades of the first and third pairs are formed with small projections 20 which, when the blades are mounted, extend towards the respective frusto-conical members 8 and 9 to which they are adjacent. Thus when a blade is mounted between a centre ring and a conical member, for example centre ring 11 and member 9, the projections 20 can move freely within the track 17 but prevent withdrawal of the blade by engaging with the rim (19). It will be appreciated that the length of the bottom of each blade and accordingly the spacing between the projections 20 on a blade is greater than the outermost diameter of the inner boss 18 so that the latter does not provide a ch ck to inward radial movement of th blad . Angular mov ment of the blade with respect to th optical axis of the luminaire is limited by th neck portion of the blade engaging one of a pair of lands 21 on each of the ring members 8 and 9. These lands surround the sockets 15 and are thus also diametrically opposed. In the embodiment shown in Figur 2, the dimensions of the lands 21 are such that th fr nt and rear blades have a maximum angular movement of 120°. Naturally, by reducing the size of the lands the maximum angular movement of a blade can be increased to almost 170°.

The two centre blades are mounted between the centre rings 10 and 11 and here the angular movement of each centre blade is limited by the cooperating recesses and projections 13 and 14. Thus these two blades have a maximum angular movement of typically 80°. The centre blades 12 differ from the front and rear blades in that they are not located within a track but between a pair of parallel surfaces. Thus in order to prevent withdrawal of a blade from between the centre rings, each centre blade has a small formed projection 22 which engages in the centre hole of ring 10 to prevent withdrawal.

It will be appreciated that a number of modifications are possible with regard to the luminaire construction which has just been described.

For example, should a simplified luminaire be required with only four adjustable blades, then it is possible to replace the pair of centre rings 10, 11 with a single ring. Such a ring would have four orthogonally arranged projections on its rim with one pair of diametrically opposed projections extending towards the sockets 15 on frusto-conical member 8 and the other pair of projections extending towards the similar sockets on the conical member 9.

It is, of course, also conceivable for the luminaire to have more than six blades by providing three or more centre rings with each additional centre ring providing in effect a slot for another pair of blades. In such a case it will, of course, be necessary to ensure that the outermost centre rings are provided with projections at their perimeters which are sufficiently long to engage in the sockets provided on the outer ring members 8 and 9 so as to lock the angular relationship between the ring members 8 and 9 and the plurality of centre rings.

It will be appreciated that whilst the members 10 and 11 have been described as being annular there is no specific reason why they should not have other shapes provided that their basic function remains unchanged.

It will be appreciated that the luminaire which has just been described affords a combination of features which are advantageous over luminaires of the prior art. Firstly, it enables the provision of four or more, for example six, blades, each of which is capable of substantial angular movement, the maximum value of which can reach 170°. Additionally, the use of the one or more c ntre rings of a mat rial which is thermally resistant means that the luminaire can be used with high powered light sources with substantially reduced risk of distortion. Yet another advantage is that although the outer blades have been given substantial freedom for angular mov ment, this freedom has not

been achieved by compromising the structural integrity of the luminaire as a whole. The reason for this is that the freedom for movement has not been achieved by cutting slots or otherwise weakening the main structural body of the luminaire. This is provided by the casing members 2 and 3 between which the remaining components of the luminaire are trapped. Finally, a still further degree of freedom is provided by the fact that whilst the ring members 8 and 9 and centre rings 10 and 11 are held against relative angular movement, the entire assembly of ring members and centre rings can be rotated about the optical axis and for this purpose one or both of the ring members 8 and 9 can be provided with a radially projecting handle.

Claims

1. A luminaire shutter housing having a plurality of shutter blades (12) and comprising a pair of opposed surfaces (8,10) each having axially aligned apertures through which light from a light source can pass along an optical axis, and characterised by means (19,20) for retaining between the surfaces the shutter blades so that the shutter blades can each be independently pivoted with respect to the optical axis over an arc of or exceeding 90°.

2. A housing as claimed in claim 1, wherein there are two pairs of opposing surfaces (8,10,11,9), each capable of retaining a pair of shutter blades in such a manner that each blade can be independently pivoted with respect to the optical axis over an arc of or exceeding 90°.

3. A housing according to claim 2 and comprising two outer members (8,9) located one on either side of a central member (10,11), the inner surfaces of the outer members and the outer surfaces of the inner member respectively providing the opposed surfaces for the two pairs of shutter blades, the members having apertures which, in the assembled luminaire, are aligned with said optical axis.

4. A housing according to claim 3, wherein the outer members and the inner member are provided with cooperating projections and sockets (13,14) which act to prevent relative rotation between the members.

5. A housing according to claim 4, wherein the face of each outer member which is opposed to the inner member is provided with a circular track (17), and wherein the shutter blades have at their extremities projections (20) which prevent their withdrawal from the housing when the outer and inner members are assembled.

6. A housing according to claim 5, wherein the inner member is provided by two or more annular members (10,11), and further comprising an additional two or more shutter blades located between said annular members.

7. A housing according to claim 6, wherein each inner member has on its perimeter a pair of diametrically opposed recesses (13) and, orthogonal to the recesses, a pair of axially extending projections (14), the arrangement being such that the projections of one ring member cooperate with the recesses of the other ring member and extend into sockets provided on the respective outer members so as to hold the two outer members and the two inner ring members against relative angular rotation movement.

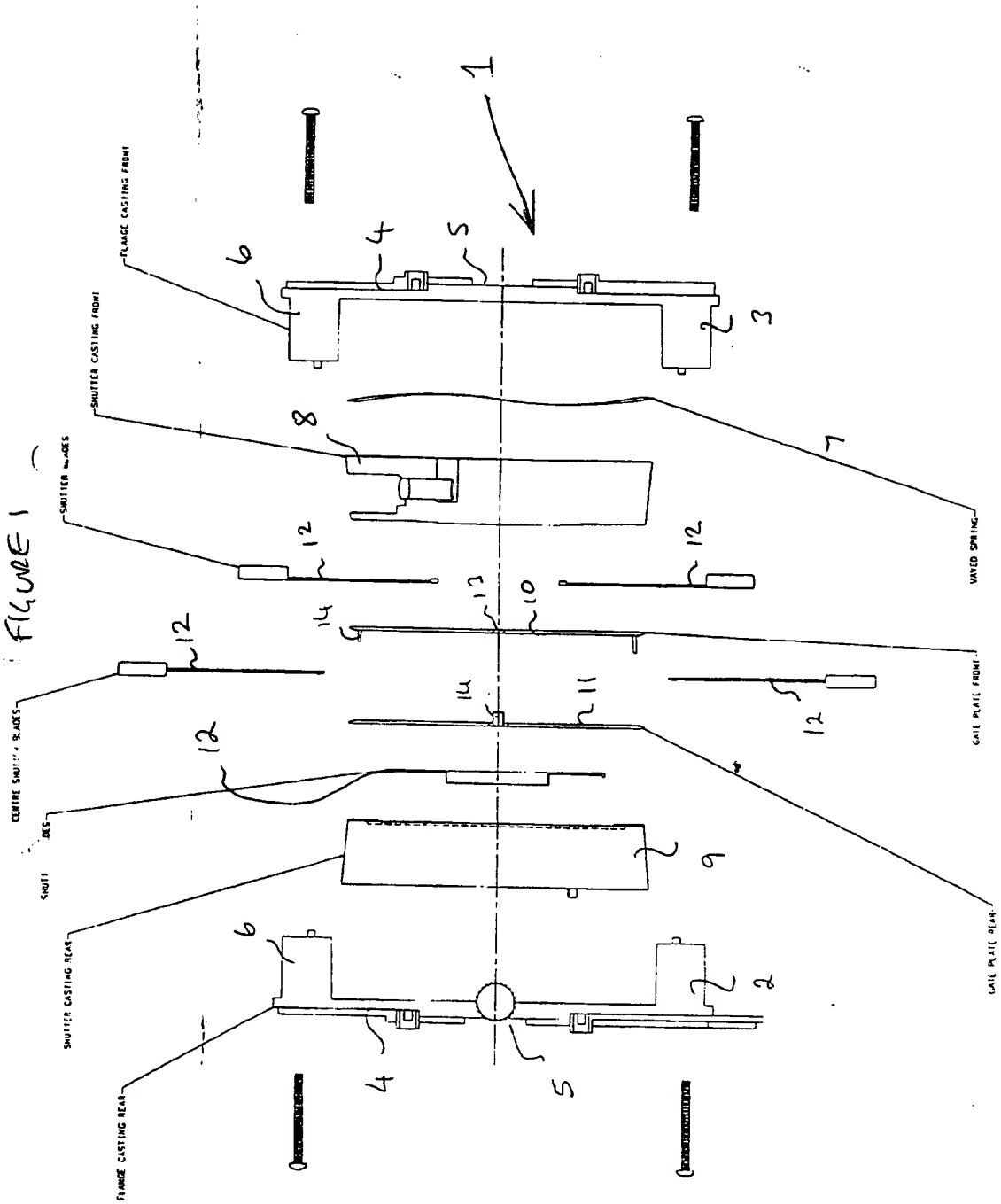
8. A housing according to any one of the preceding claims, and further comprising a pair of casing members (2,3) which are secured together so as to trap the outer members and the inner member together, under spring pressure.

9. A luminaire housing according to claim 8, wherein when the housing is assembled the outer members and the inner member or members can rotate as a body relative to the outer casing formed by the casing members.

10. A housing according to any one of the preceding claims, wherein the outer members are made from cast aluminium.

11. A housing according to any one of the preceding claims, wherein the inner member is made from a material which has greater resistance to thermal deformation than aluminium.

FIGURE 1


1
FLANGE CASTING FRONT
SHUTTER CASTING FRONT
SHUTTER BLADES
CENTRE SHUTTER BLADES
SHUTTER CASTING REAR
FLANGE CASTING REAR
VANED SPRING
GATE PLATE FRONT
GATE PLATE REAR
2
3
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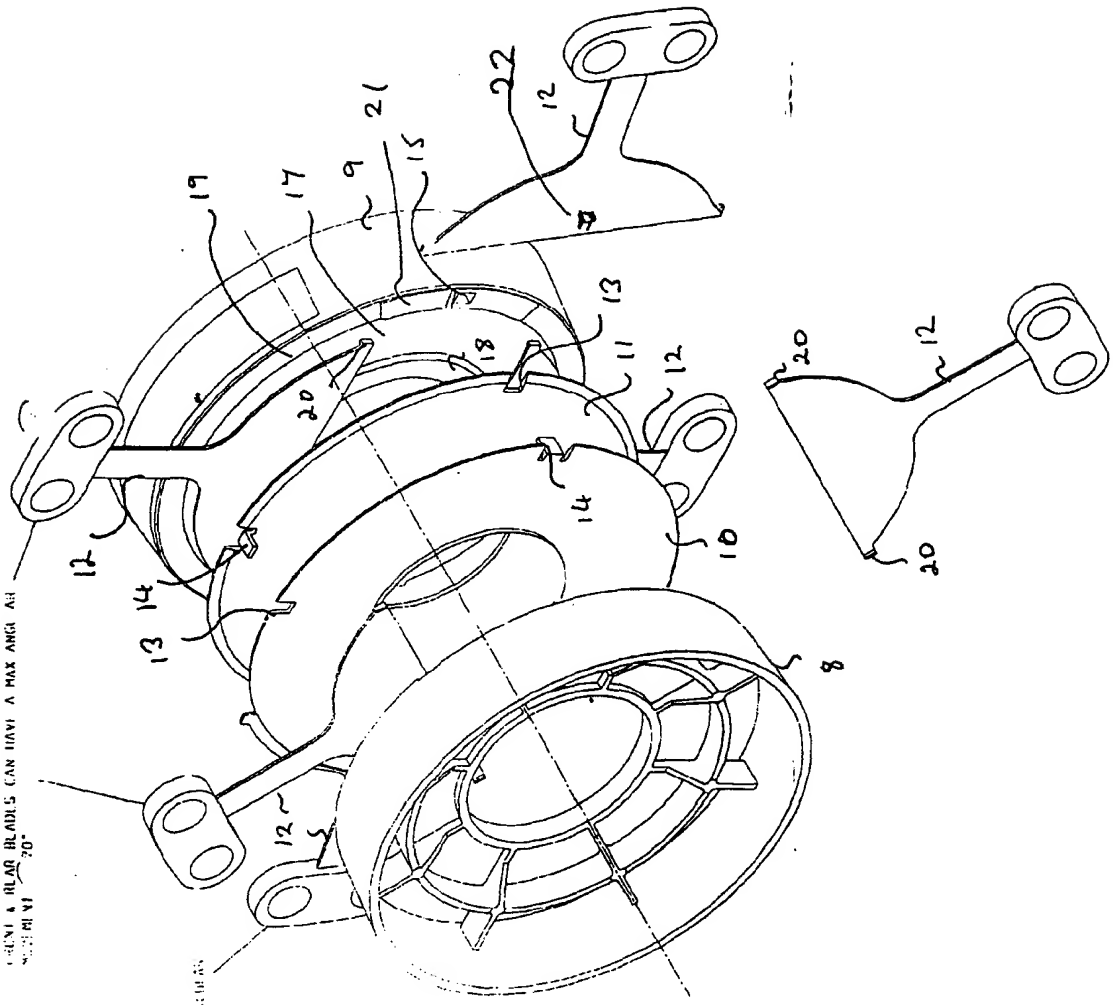

Figure 2

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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 3479

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,X	GB-A-2 265 975 (STRAND LIGHTING LTD.) * page 11, line 7 - line 18 * * page 12, line 9 - page 13, line 8 * * page 15, line 1 - page 16, line 21 * * figures 3-5 *	1-3,10, 11	F21V11/08 F21P5/00 F21V11/18
A	US-A-4 210 955 (LABRUM) * column 2, line 21 - line 33 * * column 2, line 38 - column 3, line 5 * * column 3, line 12 - line 30 * * column 3, line 43 - line 45 * * column 3, line 65 - column 4, line 12 * * figures 1-4 *	1,10,11	
A	US-A-3 571 588 (HILZEN) * figures 2-7 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
F21V F21P

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 September 1995	De Mas, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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